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10/598,732	09/08/2006	Ken Welker	14.0248-PCT-US	9557

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EXAMINER	
SAITO, KRYSTINE E	

ART UNIT	PAPER NUMBER
3663	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/598,732	WELKER ET AL.	
	Examiner	Art Unit	
	Krystine Saito	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 June 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23,25-37 and 39-53* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23,25-37 and 39-53* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 September 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/29/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 2-7 and 18-22 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The transform function is not defined in the specification. For purposes of examination, the examiner is interpreting transfer function to mean a set of instructions which when performed carry out the desired estimating, determining, and calculating steps.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-3, 6, 9-15, 18, 19, 22, 25, 27-30, and 41 are rejected under 35 U.S.C. 102(e) as being anticipated by Zajac (6691038).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

5. With respect to claim 1, Zajac discloses collecting input data from a seismic survey spread having a plurality of spread control elements, a plurality of navigation nodes, and a plurality of sources and receivers including (Col 4, lines 49-67; Col 5, 1-3): navigation data for the navigation nodes (Col 2, lines 5-59), operating states from sensors associated with the spread control elements (Col 5, lines 19-20), environmental data for the survey (Col 2, lines 61-62), and survey design data (Col 2, lines 62-64), estimating positions of the sources and receivers using the navigation data, the operating states, and the environmental data (Col 5, lines 5-7); determining optimum tracks for the sources and receivers using the estimated positions and a portion of the input data that includes at least the survey design data (Col 5, line 7, Col 8, lines 7-9); and calculating drive commands for at least two of the spread control elements using at least the determined optimum tracks (Col 5, lines 8-10).

6. With respect to claim 2, it is inherent that the master controller (Col 5, line 11) of Zajac contains instructions for performing the steps which it performs in the method of claim 1. Thus the estimating, determining, and calculating steps are performed by this "transfer function".

7. With respect to claim 3, Zajac discloses the positions are estimated according to a spread model within the transform function, and the optimum tracks are input to the spread model for calculation of the drive commands (Col 9, lines 41-42).

8. With respect to 6, Zajac discloses the predicted residuals are use to estimate error states for sensors used to collect the environmental data (Col 5, lines 19-20; Col 10, lines 56-64).

9. With respect to claim 9, Zajac discloses the drive commands include commands for controlling at least one of the vessel propeller, vessel thruster, spread component steering devices Col 8, lines 64-67), and the vessel cable winches.

10. With respect to claim 10, Zajac discloses the sensors associated with the spread control elements include one or more sensor types of tension, water flow rate (Col 9, lines 34-36), inclination, orientation, acceleration, velocity, and position (Col 9, lines 10-12).

11. With respect to claim 11, Zajac discloses the collected environmental data includes one or more data types of current (Col 2, line 61), salinity (Col 2, lines 61-62), temperature (Col 2, line 61), pressure, speed of sound, wave height, wave frequency, wind speed (Col 2, line 61), and wind direction.

12. With respect to claim 12, Zajac discloses the survey design data is selected from spread tracks, performance specifications (Col 2, lines 62-64), and survey objectives, wherein the performance specifications are selected from drag and maneuvering characteristics for the vessel (Col 2, line 64), steerable cable devices, steerable source

devices, and deflectors, drag characteristics for the towed cables, sources, and floatation devices (Col 2, lines 62-64), and winch operating characteristics.

13. With respect to claim 13, Zajac discloses the survey design data includes one or more data types of area, depth, area rotation or shooting orientation, line coordinates, source and receiver positions (Col 2, lines 55-59), required coverage, local constraints, optimizing factors and historical data; and the collected input data includes one or more data types of pre-survey, operator input (Col 8, line 9), present survey, near-real time, real-time survey, and simulated survey.

14. With respect to claim 14, Zajac discloses the operator input data includes spread parameter settings (Col 8, lines 7-9) and environmental data, and wherein the pre-survey data includes environmental sensor data (Col 2, 61-66).

15. With respect to claim 15, Zajac discloses the real-time survey data includes one or more data types of cable tension, water flow rate (Col 9, lines 34-36), inclination, orientation, acceleration, velocity, position (Col 9, lines 10-12), spread control element setting, environmental data, seismic signal and noise data, and operator input.

16. With respect to claims 18 and 22, Zajac discloses the spread model is a hydrodynamic force model of the spread components, a pure stochastic model of the spread components, employing one of the L-norm fitting criteria, or a neural network (Col 9, lines 41-42).

17. With respect to claim 19, Zajac discloses the force model contains marine current data (Col 9, lines 41-43).

18. With respect to claim 25, Zajac discloses towing a plurality of seismic survey spread elements generally behind a vessel having one or more spread control elements (Col 4, lines 51-54; Col 6, lines 34-57); providing a first set of desired coordinate positions of at least two of the spread control elements (Col 5, line 7; Col 8, lines 11-15), independently measuring the a set of actual coordinate positions of the at least two of the spread control elements (Col 4, lines 66-67; Col 8, lines 15-17); calculating a difference between the set of desired coordinate positions and the set of actual coordinate positions to form residuals (Col 5, lines 5-7; Col 8, lines 29-31); and using the residuals as set points in one or more controllers calculating to calculate drive commands for the at least two of the spread control elements (Col 5, line 8; Col 8, lines31-35).

19. With respect to claim 27, Zajac discloses planning a path for the vessel within a constraint corridor that allows steering available in the spread control elements to achieve a target shape and track for the seismic survey spread elements (Col 8, lines 1-38).

20. With respect to claim 28, Zajac discloses estimating optimum tracks for tow points of the spread control elements that provide a cross-line component relative to an optimum track for the spread control elements (Col 8, lines 11-15).

21. With respect to claim 29, Zajac discloses the set of desired coordinate positions is provided by one or more data types selected from operating states from sensors associated with the spread control elements, environmental data for the survey, and survey design data (Col 8, lines 11-15).

22. With respect to claim 30, Zajac discloses each of the drive commands is used to control at least one of position Col 9, lines24-25), speed (Col 9, lines 24-28), and heading of the vessel.

23. With respect to claim 41, Zajac discloses the spread control elements comprise a vessel control element and a streamer control element in coordination with each other (Col 8, lines 65-66).

Claim Rejections - 35 USC § 103

24. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

25. Claims 4, 5, 7, 16, and 53 are rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Brunet (6618321).

26. Zajac discloses the invention as discussed above. However, it does not disclose the spread model calculates a first set of estimated positions using input that includes at least the operating states and the environmental data, the navigation data includes a second set of estimated positions, and the first and second set of estimated positions are combined with the transform function to produce the estimated source and receiver positions and predicted residuals; the predicted residuals are used to estimate a set of parameters that characterize the spread model, and the spread model parameters are used to calibrate the spread model; the optimum tracks are determined according to a weighting function within the transform function, wherein the weighting function receives

as inputs the survey design data and the estimated positions; the simulated survey data includes one or more data types of simulated pre-survey, simulated operator input, simulated current survey, simulated near-real time survey, simulated real-time survey, and simulated environmental data; the positions are estimated according to a spread model used to predict residuals, and further comprising: using the predicted residuals to estimate one or more parameters of the spread model; and feeding the parameters back into the spread model.

27. Brunet teaches the spread model calculates a first set of estimated positions using input that includes at least the operating states and the environmental data (Col 4, lines 39-41), the navigation data includes a second set of estimated positions (Col 4, lines 26-28), and the first and second set of estimated positions are combined with the transform function to produce the estimated source and receiver positions and predicted residuals; the predicted residuals are used to estimate a set of parameters that characterize the spread model, and the spread model parameters are used to calibrate the spread model (Col 5, lines 17-21); the optimum tracks are determined according to a weighting function within the transform function, wherein the weighting function receives as inputs the survey design data and the estimated positions (Col 4, lines 45-55; Col 5, lines 11-13); the simulated survey data includes one or more data types of simulated pre-survey, simulated operator input, simulated current survey, simulated near-real time survey, simulated real-time survey, and simulated environmental data (Col 2, lines 49-52); the positions are estimated according to a spread model used to predict residuals, and further comprising: using the predicted residuals to estimate one

or more parameters of the spread model (Col 5, lines 17-21); and feeding the parameters back into the spread model (Col 4, lines 42-55).

28. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the predicted residuals of Brunet since such a modification would have led to more accurate positioning results. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the weighted optimum track determination of Brunet since such a modification would have ensured that the most important factors were those which were taken most strongly into account in the path determination. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the simulated data of Brunet since such a modification would have given a good prediction of environmental factors to take into account for more accurate positioning of the streamers.

29. Claim 8 is rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Saban (5448233).

30. Zajac as modified teaches the invention as discussed above. However, it does not teach validating the calculated drive commands and delivering the validated drive commands to the spread control elements, whereby a desirable survey objective may be attained.

31. Saban teaches validating and subsequently executing drive commands (Col 4, lines 21-24).

32. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the command validation of Saban, since such a modification would have ensured collisions with obstacles or other components.

33. Claims 17 and 23 are rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Riley (7446706).

34. Zajac as modified teaches the invention as discussed above. Furthermore, Zajac teaches a database for receiving input data (Col 4, lines 63-64; Col 8, lines 29-31). However, it does not teach the collected input data further includes raw seismic sensor data, and using the raw seismic sensor data to produce quality indicators for the estimated positions, the quality indicators selected from binning datasets, absolute noise data, signal-to-noise ratios, and seismic signal frequency content; and a computer readable medium having computer executable instructions.

35. Riley teaches the collected input data further includes raw seismic sensor data, and using the raw seismic sensor data to produce quality indicators for the estimated positions (Col 5, lines 61-66), the quality indicators selected from binning datasets, absolute noise data, signal-to-noise ratios, and seismic signal frequency content (Col 6, lines 3-67; Col 7, lines 1-15); and a computer readable medium having computer executable instructions (Col 13, lines 42-67; Col 14, lines 1-12).

36. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the quality indicators of Riley since such a modification would have provided data for error estimates in the processing of the data. It would have been obvious to one of ordinary skill in the art at the time of the invention

to modify the method of Zajac with the computer readable medium of Riley since such a modification would have allowed the method to be portable and executable on multiple systems.

37. Claim 20 is rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Gikas et al, "Reliability analysis in dynamic systems: Implications for positioning marine seismic networks", *Geophysics*, Vol. 64, No. 4, July-August 1999, pgs. 1014-1022.

38. Zajac as modified teaches the invention as discussed above. However, it does not teach the spread model is a pure stochastic model of the spread components (pg 1018, Col 1, lines 6-28).

39. Gikas teaches the spread model is a pure stochastic model of the spread components (pg 1018, Col 1, lines 6-28).

40. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the stochastic spread model of Gikas since such a modification would have given easily understandable measures of both internal and external reliability and can be used in both the design of seismic spread and in real time to ensure that appropriate quality control is possible.

41. Claim 21 is rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Armstrong et al., "The best parameter subset using the Chebychev curve fitting criterion", *Mathematical Programming*, Vol. 27, No. 1, September 1983, pages 64-74.

42. Zajac as modified teaches the invention as discussed above. However, it does not teach the spread model employs one of the L-norm fitting criteria.

43. Armstrong teaches that the L-norm fitting criterion is a widely studied curve fitting method (Abstract). Since Zajac gives a set of points for the positions of current and legacy data for the optimum spread component positions (Col 8, lines 1-15), it would have been obvious to one of ordinary skill in the art at the time of the invention to modify method of Zajac to use the L-norm fitting criteria of Armstrong to calculate the spread model by fitting the curve to the given points.

44. Claim 26 is rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Rau (6292436).

45. Zajac as modified teaches the invention as discussed above. However, it does not teach at least one of the controllers uses a PID correction method.

46. Rau teaches the invention as discussed above. However, it does not teach at least one of the controllers uses a PID correction method (Col 30, lines 63-66).

47. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the PID algorithm of Rau since such a modification would have given a good positioning device command algorithm.

48. Claim 31 is rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Semb (6681710).

49. Zajac as modified teaches the invention as discussed above. However, it does not teach the drive commands include commands for controlling at least one of a vessel propeller, a vessel thruster, a vessel thruster setting, a vessel propeller pitch, a vessel propeller rotation speed, a vessel rudder angle or combinations thereof.

50. Semb teaches the drive commands include commands for controlling at least one of a vessel propeller, a vessel thruster, a vessel thruster setting, a vessel propeller pitch, a vessel propeller rotation speed, a vessel rudder angle or combinations thereof (Col 3, lines 34-36).

51. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the vessel commands of Semb since such a modification would have allowed for more accurate positioning of the survey.

52. Claims 32-37 are rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Onat (6088298).

53. Zajac as modified teaches the invention as discussed above. However, it does not teach activating only a selected portion of the sources that are at the proximities of the desired cross line positions; the number of the selected portion of the sources is less than the total number of sources; the selected portion of the sources form at least one linear source array parallel to the streamers; and a controller that activates the sources.

54. Onat teaches activating only a selected portion of the sources that are at the proximities of the desired cross line positions (Col 2, lines 55-56, 61-63); the number of the selected portion of the sources is less than the total number of sources (Col 2, lines 55-56, 61-63; Fig 1); the selected portion of the sources form at least one linear source array parallel to the streamers (Col 2, lines 55-56, 61-63; Fig 1); and a controller that activates the sources (Col 2, line 55).

55. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the source activation of Onat since such a modification would have allowed for the modification of the operational center frequency of the transducer array without excessive movement of the array.

56. Claims 39, 40, 42, and 45-51 are rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Itria (4063213).

57. Zajac as modified teaches the invention as discussed above. However, it does not teach the spread control elements comprise a source control element.

58. Itria teaches the invention as discussed above. However, it does not teach the spread control elements comprise a source control element (Abstract, lines 1-2; Col 4, lines 7-9).

59. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the source control elements of Itria since such a modification would have allowed for accurate positioning of the source elements.

60. Claims 43, 44, and 52 are rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Bennet (6590831).

61. Zajac as modified teaches the invention as discussed above. However, it does not teach the spread control elements comprise at least two control elements in coordination with each other; one of the at least two vessel control elements is associated with a first vessel and another of the at least two vessel control elements is associated with a second vessel.

62. Bennet teaches the spread control elements comprise at least two control elements in coordination with each other (Col 4, lines 20-58; Fig 1); one of the at least two vessel control elements is associated with a first vessel and another of the at least two vessel control elements is associated with a second vessel (Col 4, lines 20-58; Fig 1).

63. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the vessel control elements of Bennet since such a modification would have maximized the safety of the vessels, seismic assets, and crew while also minimizing deviations from desired spatial configuration of the assets.

Conclusion

The prior art which is cited but not relied upon is considered pertinent to applicant's disclosure: 6873571, 5281773, and 7047898.

The references made herein are done so for the convenience of the applicant. They are in no way intended to be limiting. The prior art should be considered in its entirety.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krystine Saito whose telephone number is 571-270-7614. The examiner can normally be reached on Monday thru Thursday, 8am-5:30pm EST and alternate Fridays 8am-4:30pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. S./
Examiner, Art Unit 3663

/Scott A. Hughes/
Examiner, Art Unit 3663